

Chapter 3. Inspection

“compliance with design, maintenance and user requirements”

Vehicle and Axle Load Scales

NIST Handbook 44

■ General Code

- Application (G-A.1.) (G-A.2. conflicts with other codes)
- Specifications (G-S.1.)
- Notes (G-N.)
- Tolerances – (G-T.1. & 2. acceptance, maintenance)
- User Requirements (G-UR.4.1.)

NIST Handbook 44

■ Device Codes

- Application (A.1.) (mfg, sellers, users)
- Specifications (S.1.) (mfg, technicians)
- Tolerances (T.1.) (everyone)
- Notes (N.1. Tests) (officials, technicians)
- User Requirements (UR.1.) (everyone)
- Research the item using NCWM Reports

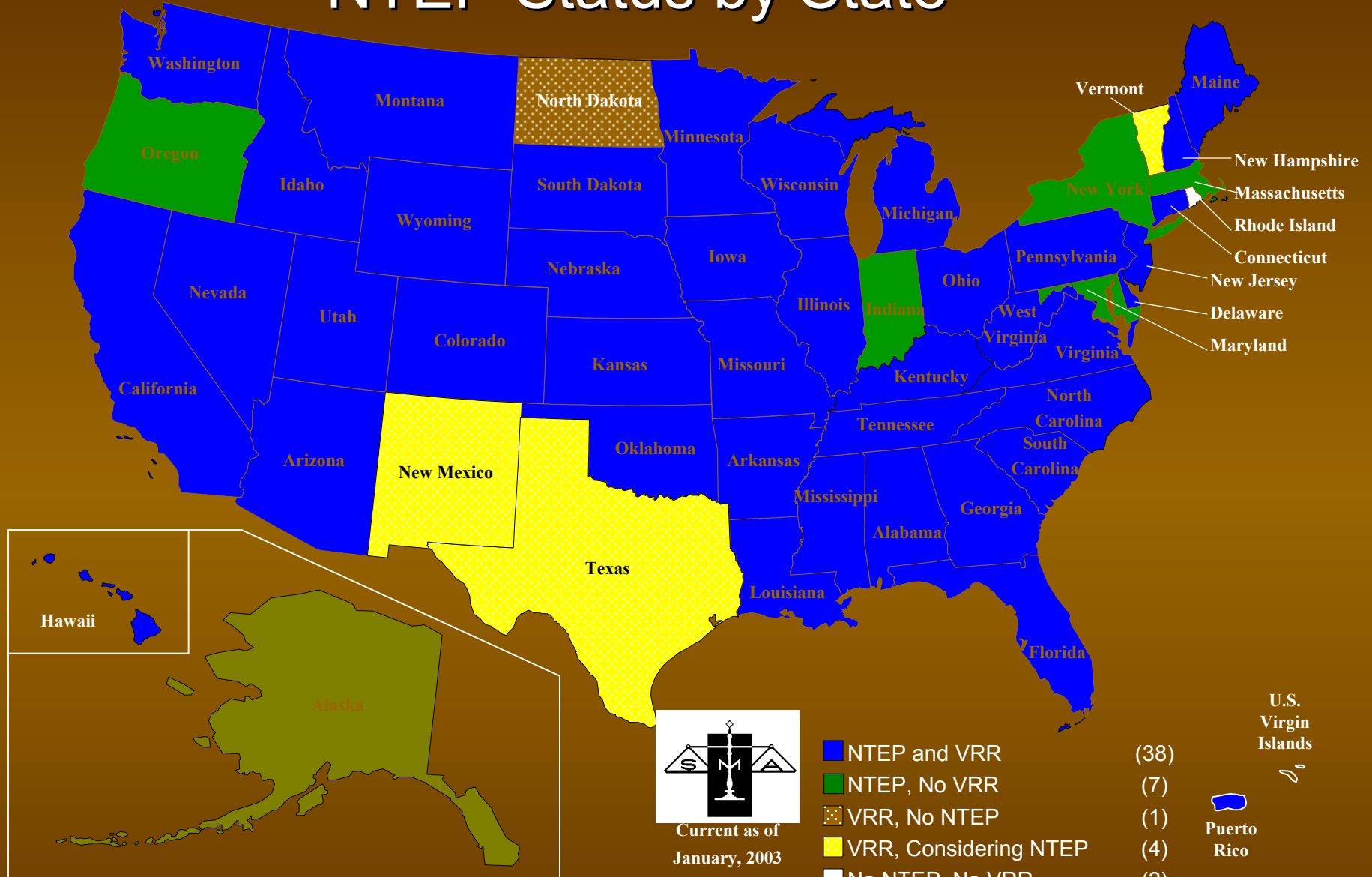
NIST Handbook 44

- Definitions
- Fundamental Considerations
 - Concept of acceptance and maintenance tolerances and the theory of tolerances.
 - Tolerances are “primarily accuracy criteria for use by the regulatory official.”
 - Not to bring equipment “merely within” tolerances when it is possible to adjust ‘closer’ to zero error.
- Test Apparatus, Inspection, other topics.

National Type Evaluation Program

- Managed by the National Conference on Weights and Measures Inc.
- Conduct Type Evaluations of scales, liquid measuring devices, load cells, and other instruments.
- Certificate of Conformance (Certificate) are excellent tools for field inspectors.
 - Eliminates many of the difficult compliance questions (e.g., temperature).

NTEP Status by State

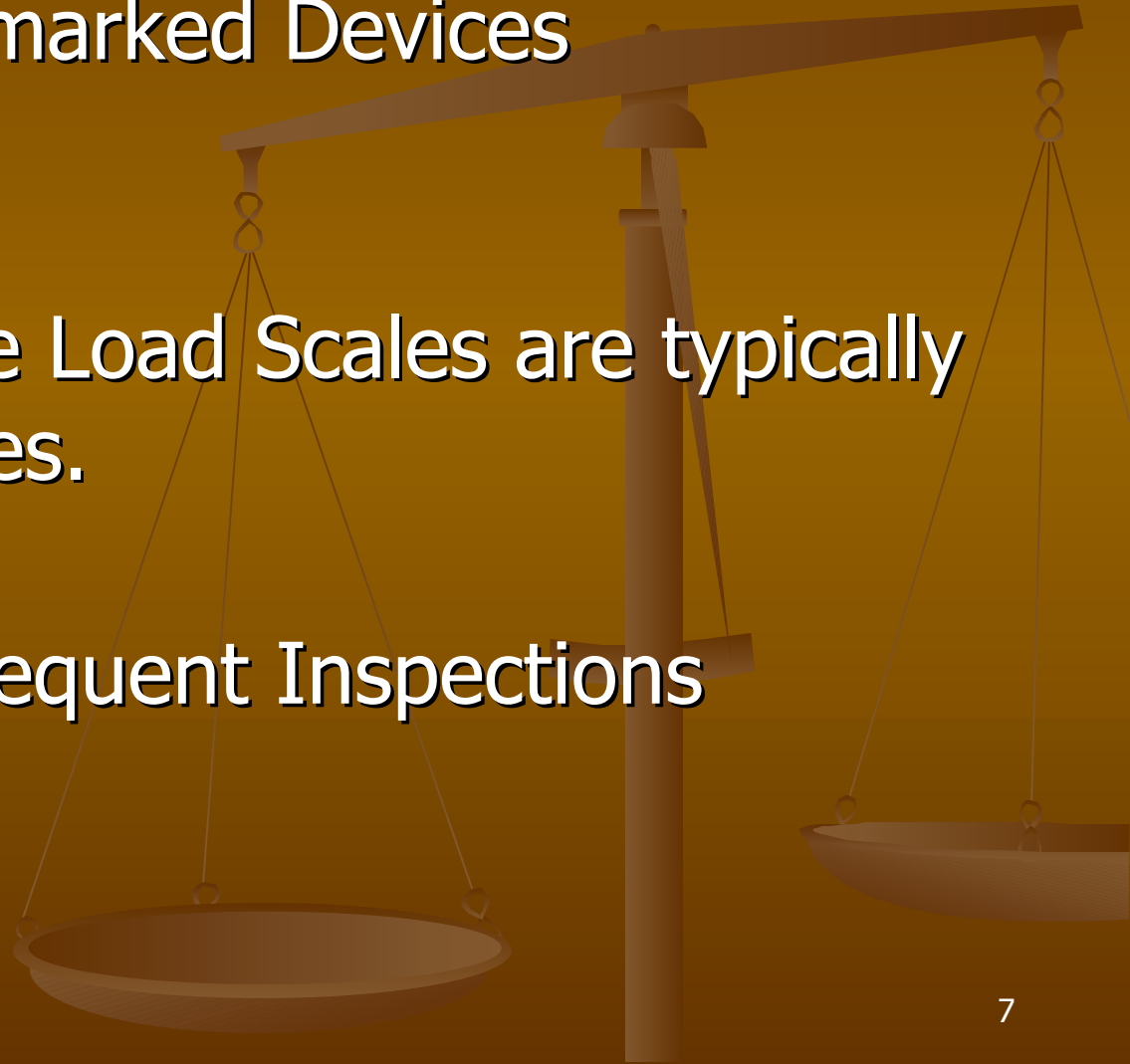


NTEP: Uniform Regulation for National Type Evaluation

VRR: Uniform Regulation for Voluntary Registration of Service Persons and Service Agents

General Considerations

- Marked and Unmarked Devices
 - 1986
- Vehicle and Axle Load Scales are typically Class IIIL devices.
- Initial and Subsequent Inspections



- **G-S.2. Facilitation of Fraud.** - All equipment and all mechanisms and devices attached thereto or used in connection therewith shall be so constructed, assembled, and installed for use such that they do not facilitate the perpetration of fraud.

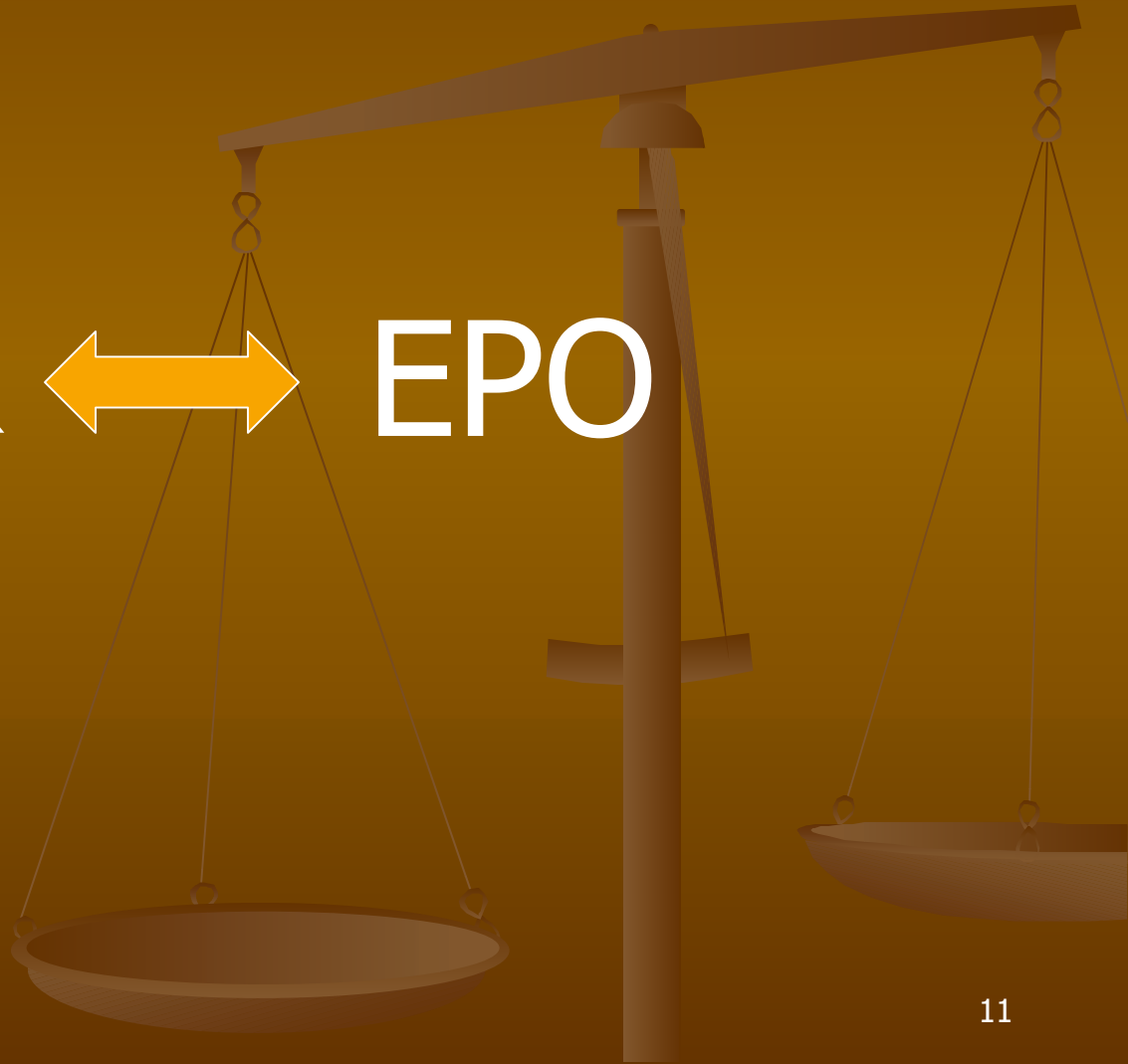
G-A.6. Non-Retroactive Requirements

- Enforceable after the effective date for:
 - Devices manufactured within a state;
 - New and used devices brought into a state;
 - Non-commercial devices that the owner or user wants to switch to commercial use.
- They do not apply to devices in stock at dealers or to those in commercial use.
- *They are shown in italic text in the handbook and include a non-retroactive date (2004)*

G-A.5. Retroactive Requirements

- Apply to all equipment.
- Non-retroactive requirements are periodically reviewed by the NCWM Specifications and Tolerances Committee to see if they should be made retroactive.
- Giving notice well in advance helps eliminate most enforcement issues.

NIST Handbook ↔ EPO 44



Zero Indications



S.1.1. Zero Indication

With no load on the load receiving element:

- (a) Indicating or recording elements must indicate or print zero.
- (b) An automatic indicating scale or balance indicator shall indicate an out of balance condition.

Zero Load Balance – As Found

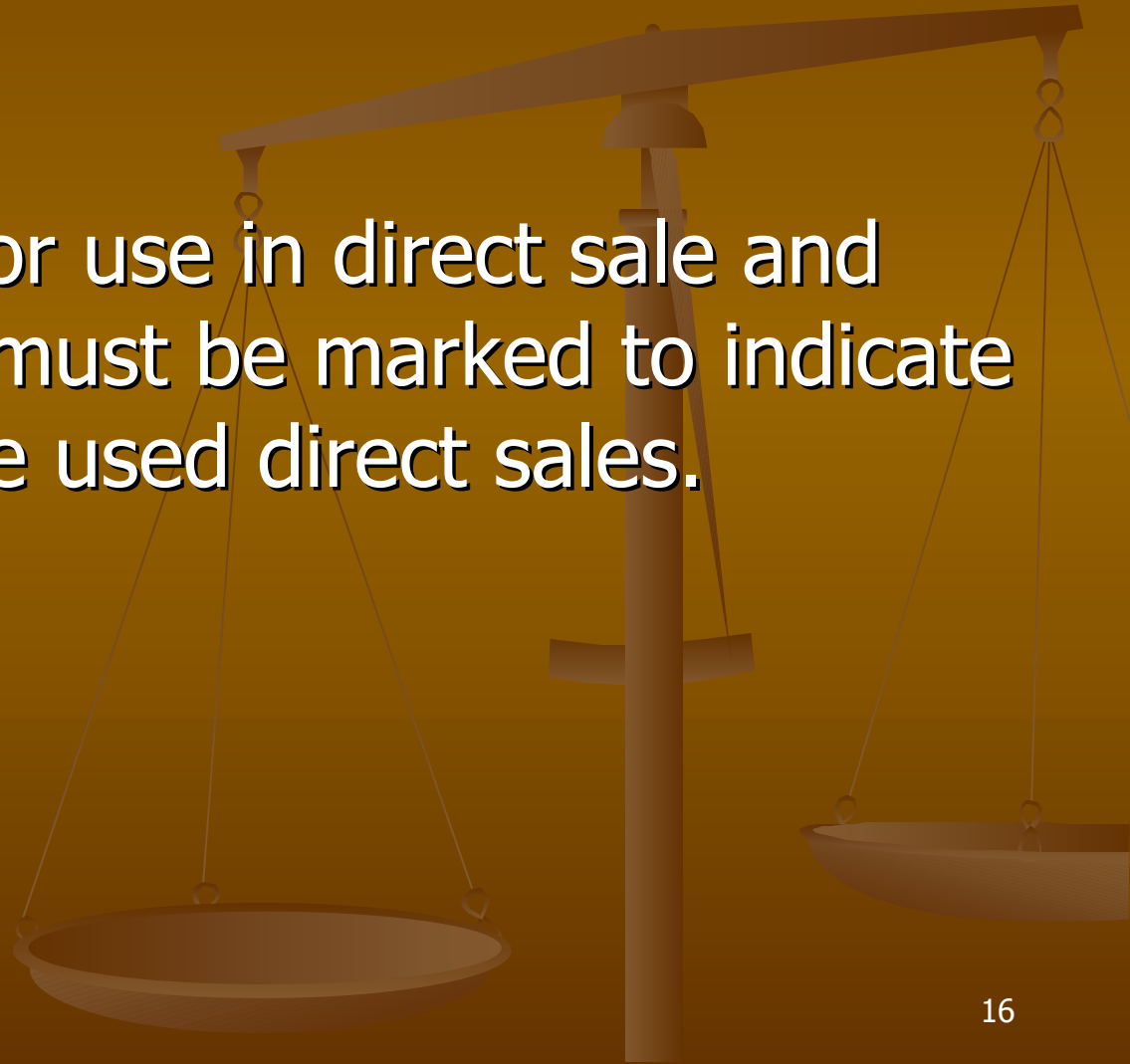
- UR.4.1. Balance Condition – maintained so it indicates or records zero when there is nothing on the load receiving element.
 - For truck scales the biggest causes are shock loading, debris, friction/binding, rain or dirt buildup.
- Document your findings and ask the operator to reset zero to both correct the problem and to determine if the individual knows how to operate the controls.

S.2.1.2.Scales in Direct Sales

- Manual zero can only be adjusted with a tool (except digital with analog adjustment with a range up to 1 d) or it shall be enclosed.
- Pushbutton zero must be tool operated or be enclosed or shall operate only when the indication is stable within ± 3 d.

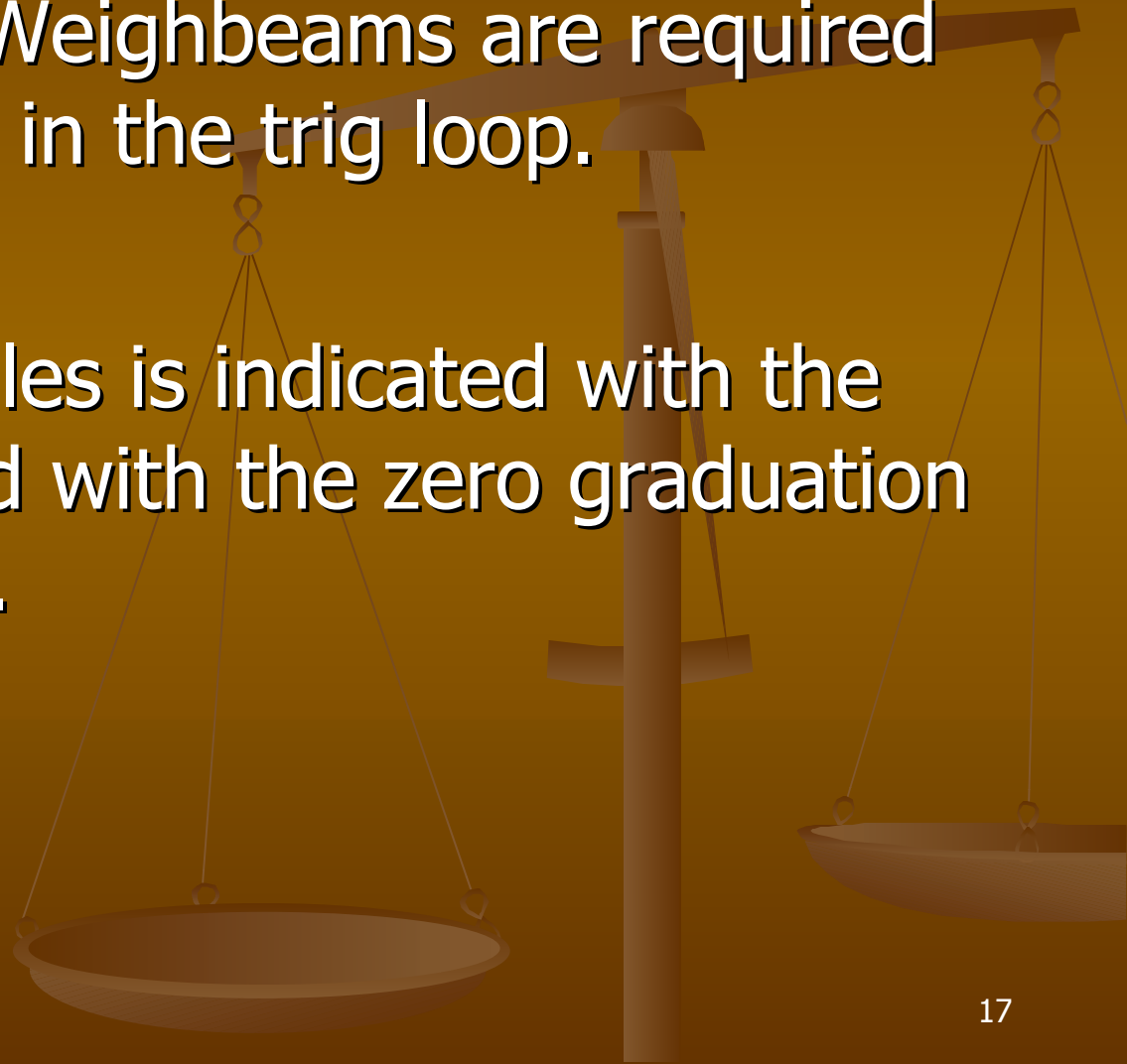
S.2.1.6. Combined Zero/Tare Key

- O/T Key
- Not permitted for use in direct sale and the instrument must be marked to indicate that it cannot be used direct sales.
- Added 1998



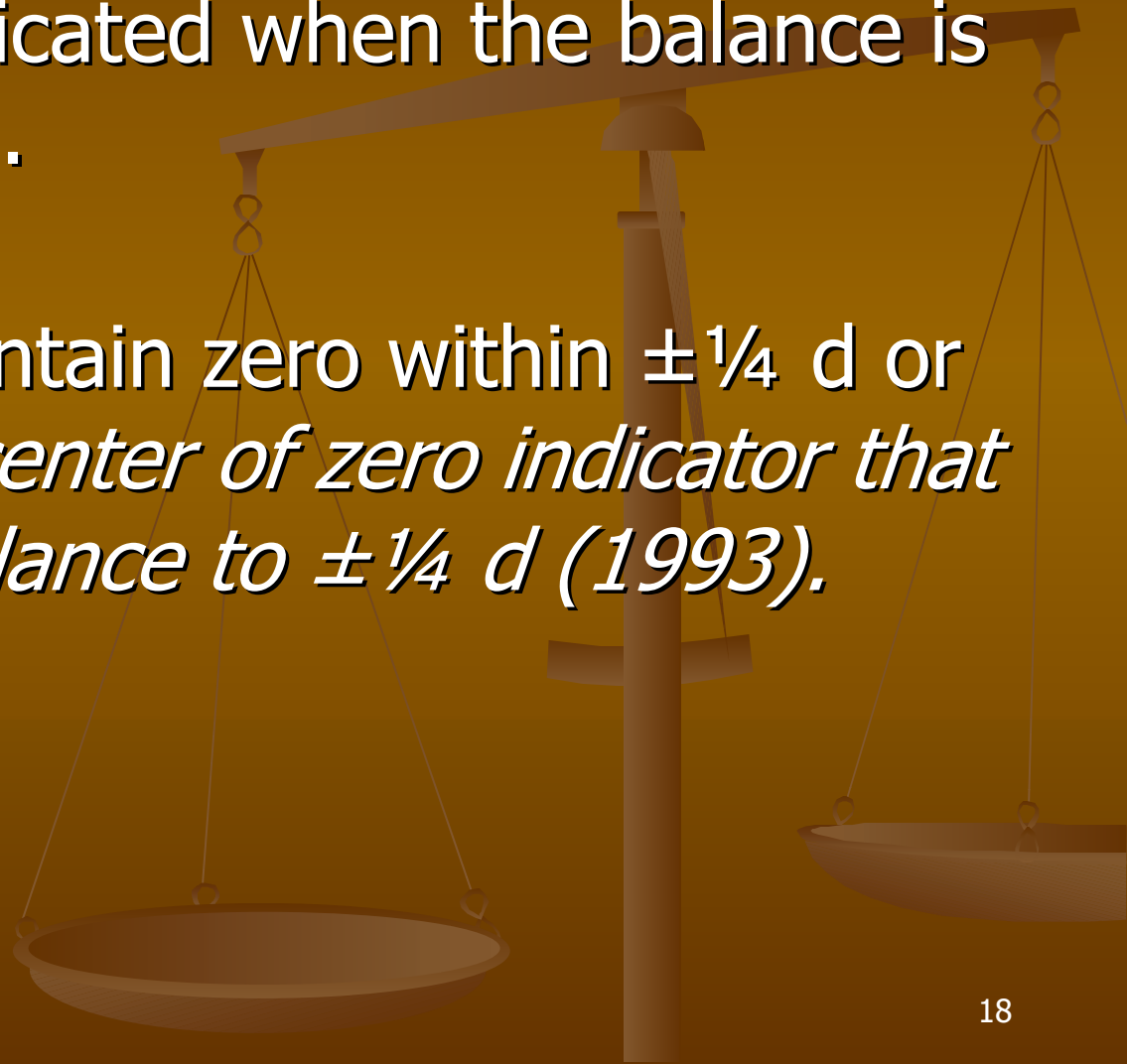
Zero on other Indicators

- Under S.1.5.1. Weighbeams are required to be horizontal in the trig loop.
- Zero on dial scales is indicated with the indicator aligned with the zero graduation on the dial face.



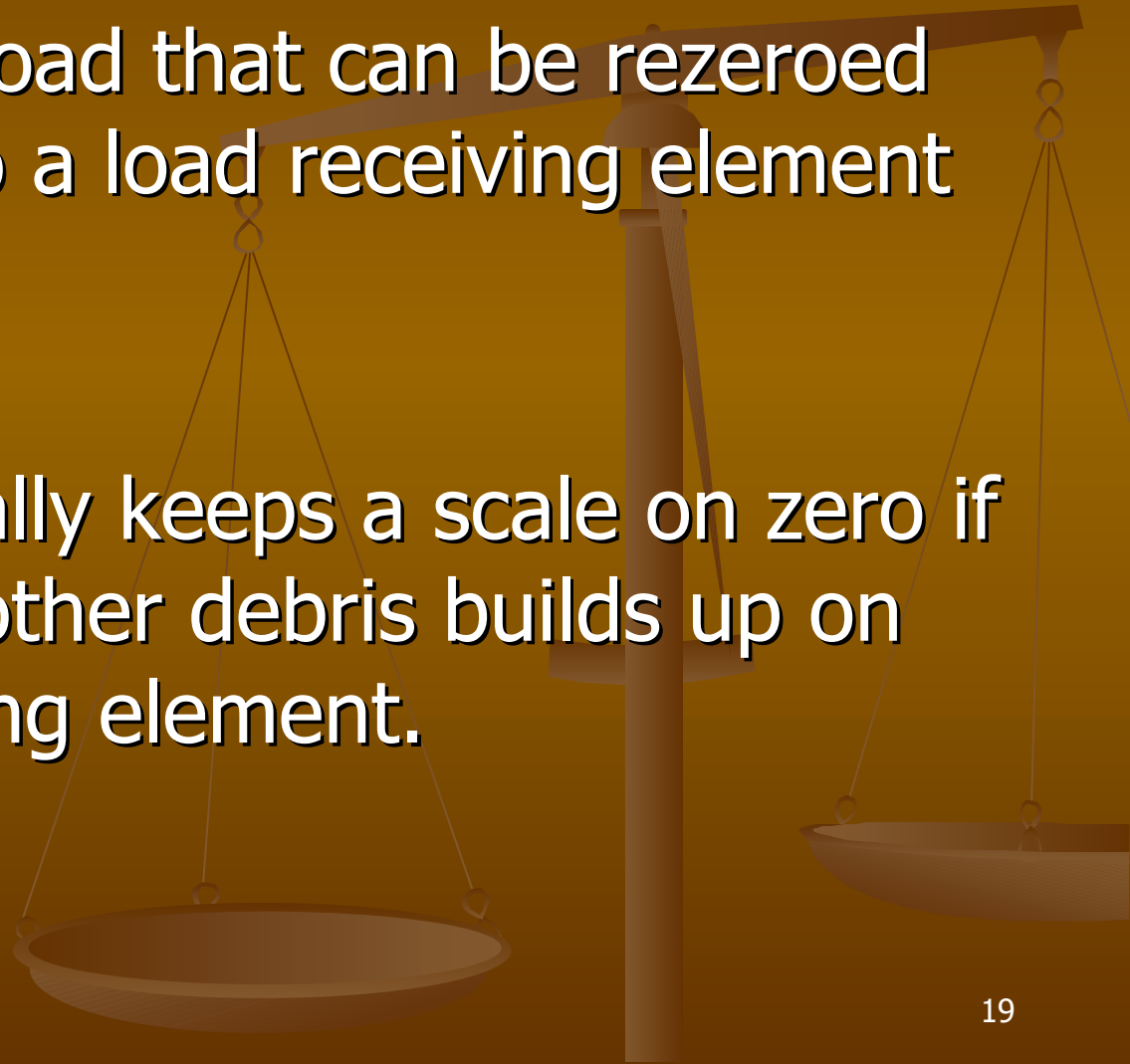
S.1.1.1. Digital Indicators

- Zero can be indicated when the balance is as much ± 0.5 d.
- Shall either maintain zero within $\pm \frac{1}{4}$ d or less or *have a center of zero indicator that defines zero-balance to $\pm \frac{1}{4}$ d (1993).*



S.2.1.3. Scales with Automatic Zero-Setting Mechanism

- The maximum load that can be rezeroed when applied to a load receiving element is $\pm 3 d$ (1981).
- AZM automatically keeps a scale on zero if water, mud or other debris builds up on the load receiving element.



G-S.5.2.2. Digital Indications and Representation

- Must include a display of zero for all places to the right of the decimal and at least one to the left: **0.00 ton**
- When no decimal values are displayed a zero must be displayed for each place of the scale division.

For a 20 lb division: **00**

Marking Requirements

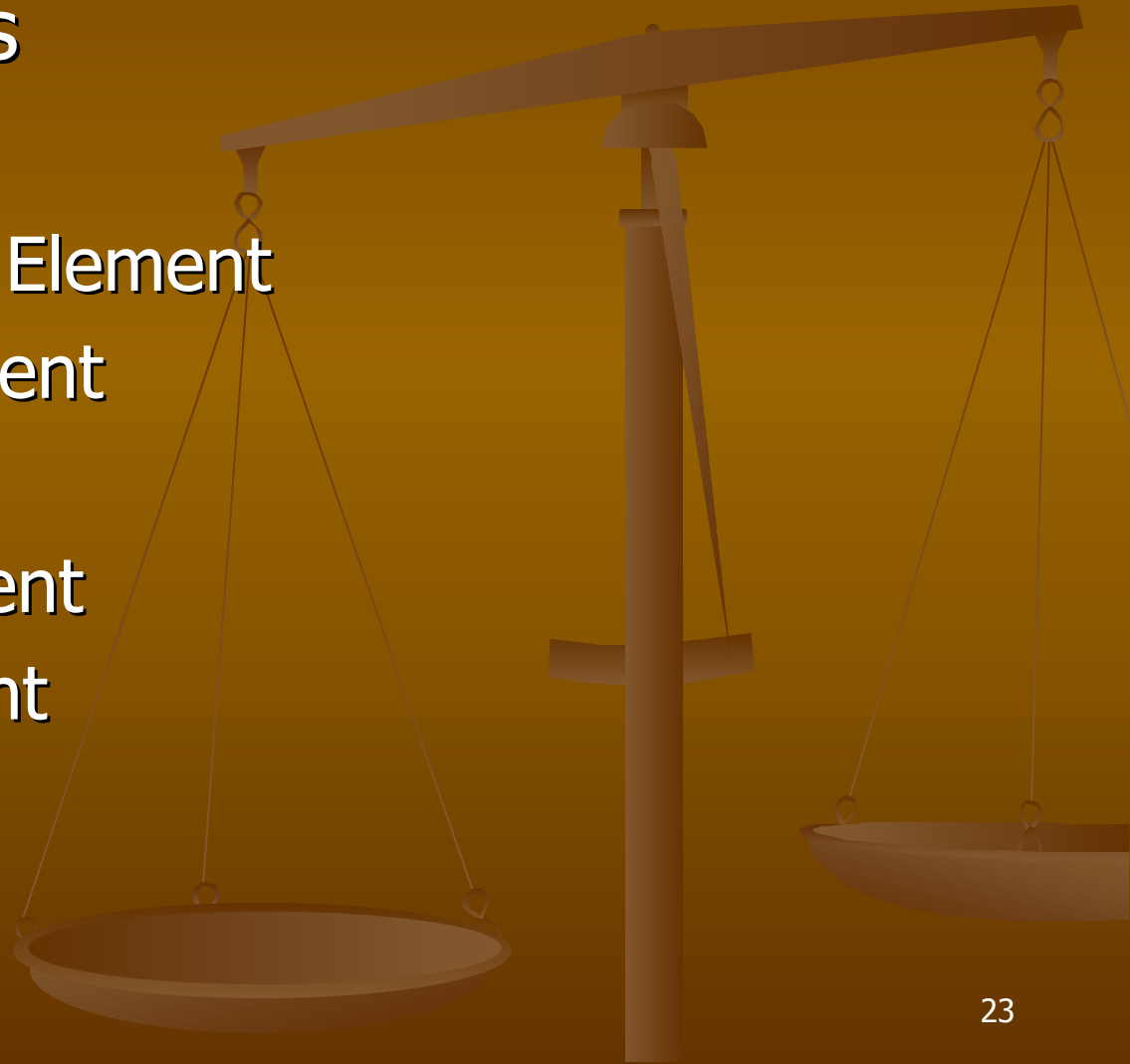


S.6.3. Scales, Main Elements, and Components of Scales or Weighing Systems.

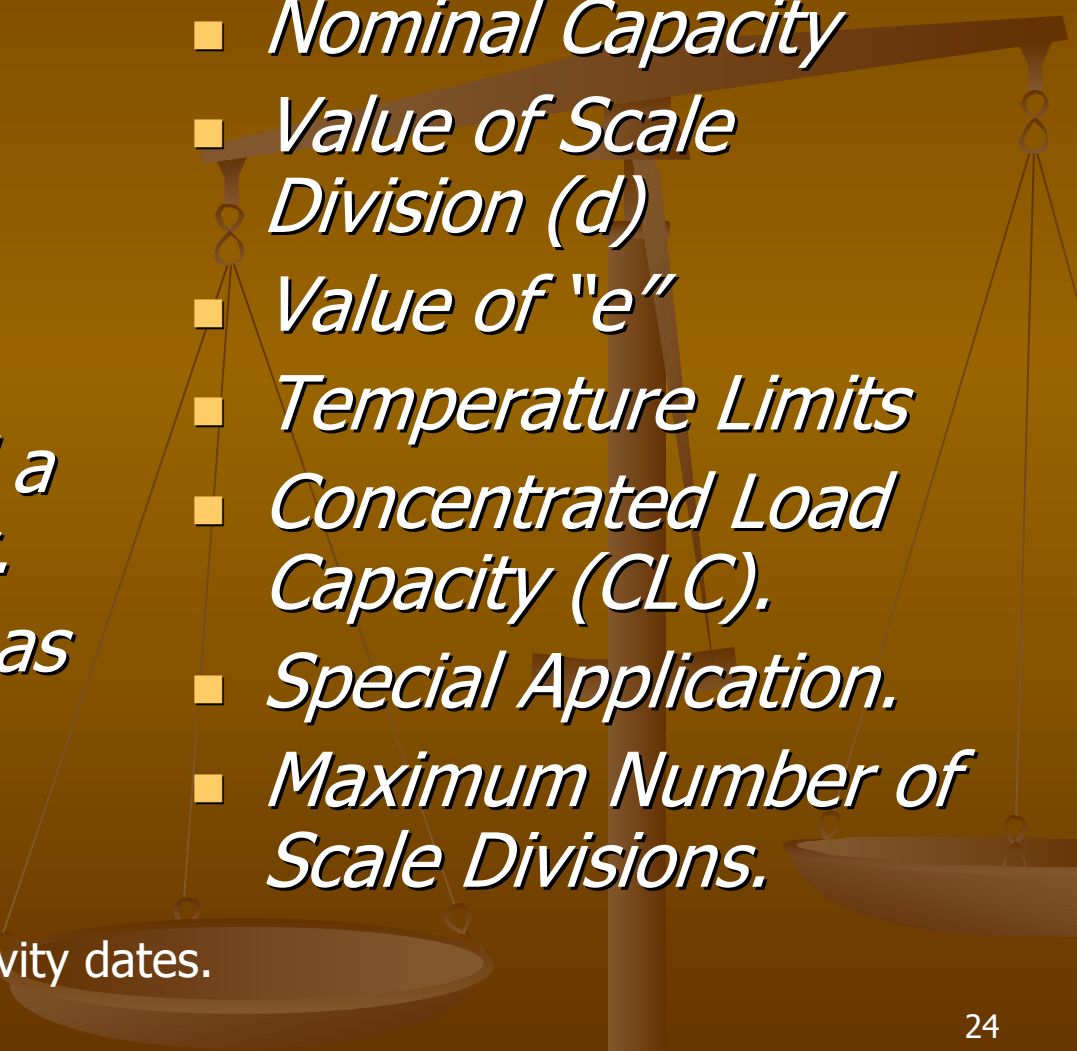
- Scales, main elements of scales (not in a single enclosure), Load Cells with NTEP CC, and other equipment (necessary to a weighing system but having no metrological effect) shall be marked as specified in Table S.6.3.a and associated notes in S.6.3.b.

S.6.3.a. Marking Requirements

- Complete Scales
- Components
 - Load Receiving Element
 - Indicating Element
 - Load Cells
 - Weighing Element
 - Other Equipment



S.6.3.a. Information

- 
- Manufacturer's Identification.
 - Model designation and *a prefix to identify it.*
 - *Serial number and a prefix to identify it.*
 - *CC (2003) if one has been issued.*
 - *Accuracy Class*
 - *Nominal Capacity*
 - *Value of Scale Division (d)*
 - *Value of "e"*
 - *Temperature Limits*
 - *Concentrated Load Capacity (CLC).*
 - *Special Application.*
 - *Maximum Number of Scale Divisions.*

See S.6.3.b for non-retroactivity dates.

S.6.3.a. Information

- *Minimum Verification Scale Division.*
- *Load Cell: S or M.*
- *Direction of Loading.*
- *Minimum Dead Load.*
- *Maximum Capacity.*
- *Safe Load Limit*
- *Load Cell Verification Interval*
- *Section Capacity*

See S.6.3.b for non-retroactivity dates.

S.6.1. Nominal Capacity; Vehicle and Axle-Load Scales.

- *For all vehicle, axle-load, scales, the marked nominal capacity shall not exceed the concentrated load capacity (CLC) times the quantity of the number of sections in the scale minus 0.5.*
- *As a formula, this is stated as: nominal capacity $\leq CLC \times (N - 0.5)$ where N = the number of sections in the scale.*
- *(See N.1.3.4. and T.N.3.1.) [1989]*

S.6.3. -- Markings for Built for Purpose Devices

- A Built for Purpose Device: any main device or element which was manufactured with the intent that it be used as, or part of, a weighing or measuring device or system.
- Example: personal computers that serve as the digital indicator are Not Built for Purpose Devices.



Not Built for Purpose Devices – Software Based

- The “scale indicator” functions are provided by a software package that takes the place of a digital indicator.
- A serial number on the PC isn't very helpful as it is the software that must conform to NIST Handbook 44.

Not Built for Purpose Devices – Software Based

- Instead, the PC must display the version of software used in the PC so officials can identify the manufacturer of the software that handles the weighing functions.
- NTEP evaluates the software for compliance with the handbook and the official verifies that the correct version is in use with the scale.

Not Built for Purpose Devices – Software Based

- G-S.1.1. was amended in 2003 to require NBPD's to:
 - *display or be marked with the manufacturer or distributor of the software and its model number or,*
 - *the NTEP Certificate of Conformance (CC) may be displayed or marked on the device or,*

Not Built for Purpose Devices – Software Based

- *it can continuously display the manufacturer or distributor, model designation, and the current software designation.*

Alternatively, the device may provide the information through the "Help" menu. The NTEP CC must include guidance on how to access the information.

Visibility of Information

- G-S.1. Identification: information must be located so that it is visible without the necessity of the disassembly of a part requiring the use of any means separate from the device.
- G-UR.2.1.1. Visibility of Identification: Equipment shall be installed in a manner that all required markings are visible.
- See S.6.2. below.

G-S.1.2. Remanufactured Devices and Remanufactured Main Elements

- *a. Name, initials, or trademark of the last remanufacturer or distributor;*
- *b. the model designation if different than the original model designation*

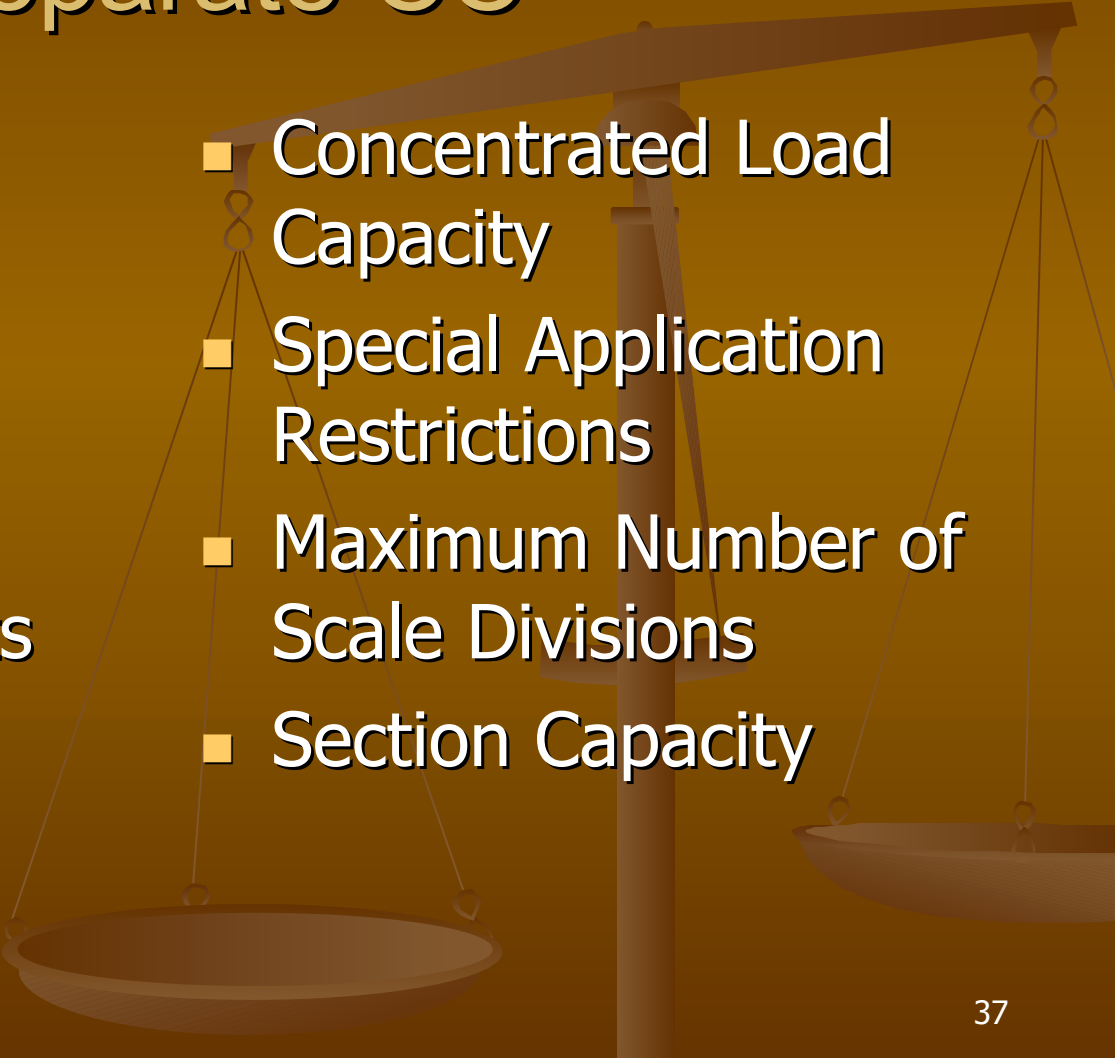
G-S.1.2. Remanufactured Devices and Remanufactured Main Elements

- Remanufactured Device: a device that is disassembled, checked for wear, parts replaced or fixed, reassembled and made to operate like a new device of the same type.

G-S.1.2. Remanufactured Devices and Remanufactured Main Elements

- Remanufactured Element: An element that is disassembled, checked for wear, parts replaced or fixed, reassembled and made to operate like a new element of the same type (e.g., load cells).

Markings: Indicators not attached to weighing elements or covered by a separate CC

- 
- Accuracy Class
 - Nominal Capacity
 - Value of Scale Division (d)
 - Value of "e"
 - Temperature Limits
 - Concentrated Load Capacity
 - Special Application Restrictions
 - Maximum Number of Scale Divisions
 - Section Capacity

FAIRBANKS

NOMINAL CAPACITY 120,000 x 20 lb

ZERO

lb
kg

GROSS
NET

AUTO
TARE

PRINT

TARE
RECALL**FAIRBANKS**

MODEL
CLASS
SERIAL

5-674

RATING	100
CAPACITY	100
S.W.A./C.O.C	100
TEMP	100

Fortbrenke, Scales, & Division of Fortbrenke, Inc.

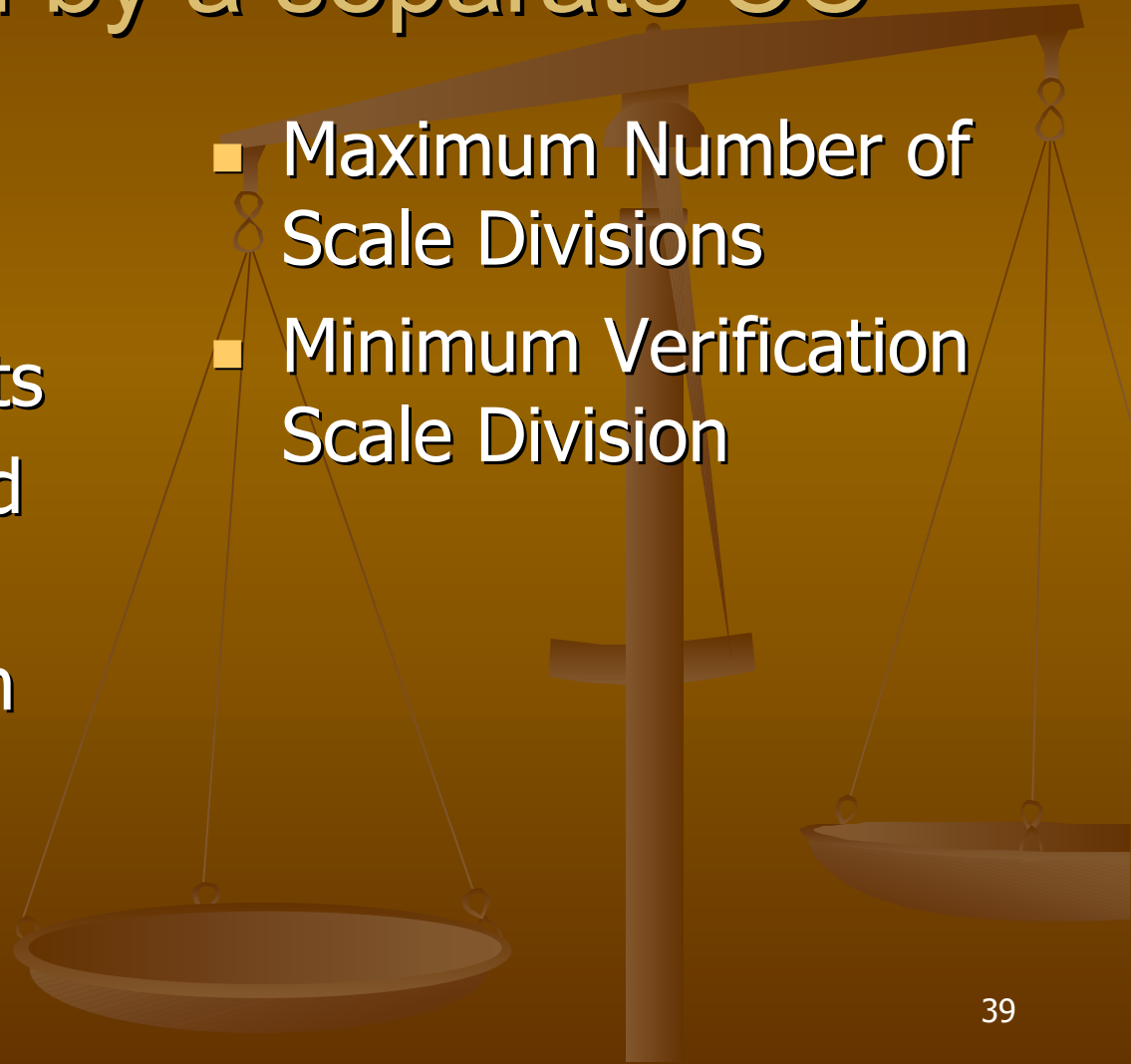
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—NOTES

Markings: load receiving elements not attached to indicating elements or covered by a separate CC

- Accuracy Class
- Nominal Capacity
- Temperature Limits
- Concentrated Load Capacity
- Special Application Restrictions

- Maximum Number of Scale Divisions
- Minimum Verification Scale Division

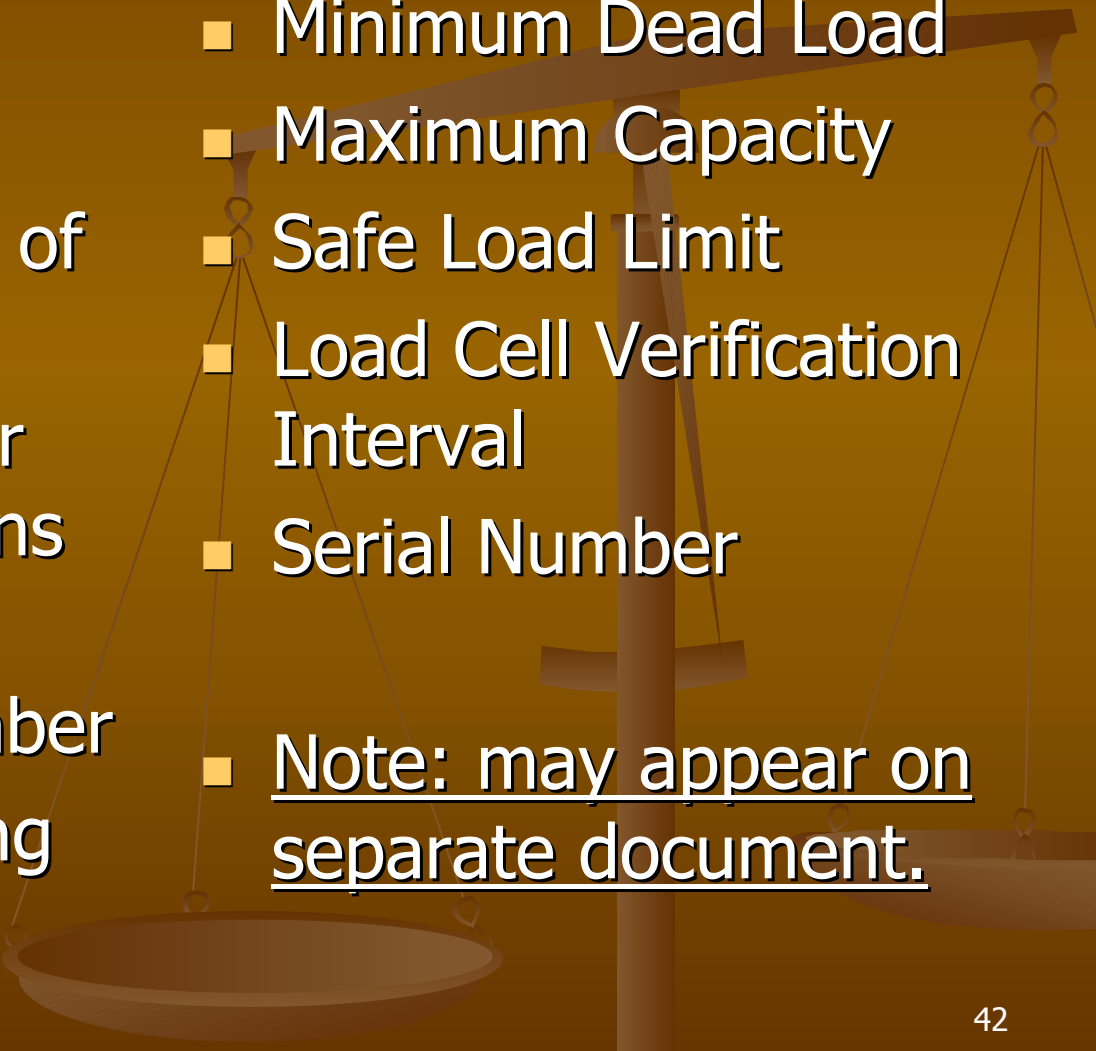


S.6.2. Location of Marking Information.

- Separate load-receiving elements may have the identification information located in an area that is accessible only through the use of a tool; provided the information is easily accessible (e.g., the junction box under an access plate). The identification information shall be located on the load-receiving element near the point where the signal leaves the weighing element or beneath the nearest access cover.



Load Cell with a CC

- 
- Manufacturer
 - Model
 - Maximum Number of Scale Divisions
 - S or M for single or multiple applications
 - Certificate of Conformance Number
 - Direction of Loading
 - Minimum Dead Load
 - Maximum Capacity
 - Safe Load Limit
 - Load Cell Verification Interval
 - Serial Number
 - Note: may appear on separate document.

MODEL	629R-R10-50K-30P5		
CLASS	III L, 10M	V min	4.8 lbs
OUTPUT	2.0 mV/V	AT	50K lbs
NTEP CERT	91-306	SERIAL No.	12345
LOAD CELLS, INC.			
CITY, STATE 99999		MADE IN USA	

Does not include direction of loading (not required if obvious), Temperature Limits, Value of "e", minimum dead or safe load limits

G-S.6. Marking Operational Controls, Indications, and Features

- *All operational controls, indications, and features, including switches, lights, displays, push buttons, and other means, shall be clearly and definitely identified. The use of approved pictograms or symbols shall be acceptable. (NR 1977)*
- Must be permanent

Device or Family
Description

***National Type Evaluation Program
Certificate of Conformance
for Weighing and Measuring Devices***

Manufacturer
Information

For:
Load Cell
Bending Beam
Model Family: 12345 Series (see below)
 n_{max} : Multiple Cells: 10 000
Capacity: 37 500 lb to 75 000

Submitted by:
Load Cell Company
123 Main Street
Anywhere, USA 12345
Tel: (111) 555-1212
Fax: (111) 555-1213
Contact:

Standard Features and Options

Model	Capacity (lb)	v_{min} (lb)	Minimum Dead Load (lb)
WBT-37.5 K	37 500	3.75	500
WBT-50.0 K	50 000	5.00	600
WBT-60.0 K	60 000	5.00	600
WBT-75.0 K	75 000	7.00	1000

Load Application Methods:

Radiused link applies load onto circular contoured knob on end of beam
Column member applies load to vertical threaded hole in end of beam

Temperature Range: -10 to 40 °C (14 to 104 °F)

Features of
Specific Models

Features and
Options

This device was evaluated under the National Type Evaluation Program (NTEP) and was found to comply with the applicable technical requirements of Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices." Evaluation results and device characteristics necessary for inspection and use in commerce are on the following pages.

Chairman, NCWM, Inc.

Chairman, National Type Evaluation Program Committee

Issue date:

Note: The National Conference on Weights and Measures does not "approve", "recommend", or "endorse" any proprietary product or material, either as a or as single item a class or group. Results shall not be used in advertising or sales promotion to indicate explicit or implicit endorsement of the product or material by the NCWM.

**Load Cell Company
Bending Beam Load Cell
Model: 12345 Series**

Application: The load cells may be used in Class III L scales for multiple cell applications consistent with the model designations, number of scale divisions, and parameters specified in this certificate. Load cells of a given accuracy class may be used in applications with lower accuracy class requirements provided the number of scale divisions, the v_{min} values, and temperature range are suitable for the application. The manufacturer may market the load cell with fewer divisions (n_{max}) and with larger v_{min} values than those listed on the certificate. However, the load cells must be marked with the appropriate n_{max} and v_{min} for which the load cell may be used.

Identification: A pressure sensitive identification badge containing the manufacture's name, model designation, and serial number is located on the load cell. All other required information, if not marked on the load cell, must be on an accompanying document including the serial number of the load cell.

Test Conditions: This Certificate supersedes Certificate of Conformance Number 04-XXXXA2 and is issued without additional testing to include a vertical threaded hole in the end of the beam for load application. The CC holder supplied technical information and performance data. This load application was also evaluated in a vehicle scale under NTEP CC 04-YYY. Previous test conditions are listed below as reference.

Certificate of Conformance Number 04-XXXXA2: This Certificate supersedes Certificate of Conformance Number 04-XXXXA1 and is issued without additional testing to include the Model 12345-60.0K, 60 000-lb capacity load cells.

Certificate of Conformance Number 04-XXXXA1: This addendum was issued to change the m_n of the Model 12345-75.0K load cell from 7.50 lb to 7.00 lb. The certificate was previously changed to include the 50 000-lb capacity load cell in the 12345 Model Family. Testing of the two 37 500-lb load cells indicated below was performed in addition to the testing performed at the time that Certificate of Conformance Number 04-XXXXP was issued. Results of the additional testing indicate it is appropriate to include the 50 000-lb load cell in this certificate.

Certificate of Conformance Number 04-XXX: This Certificate superseded Certificates of Conformance Numbers 04-XXXXP and 04-XXXXPA and was issued to upgrade the status of the certificates from provisional to full.

Certificate of Conformance Number 04-XXXXPA: This Certificate superseded Certificate of Conformance Number 04-XXXXP and was issued to include the Model 12345-50.0K, 50 000-lb capacity load cells. Two 37 500-lb capacity load cells were tested at NIST using dead weights as the reference standard. The data were analyzed for multiple load cell applications. The cells were tested over a temperature range of -10 °C to 40 °C. Three tests were run on each cell at each temperature. The temperature effect on zero was measured and a time dependence (creep) test was performed. The barometric pressure test was waived due to the insensitivity of the load cell design to changes in barometric pressure.

Certificate of Conformance Number 04-XXXXP: Two 37 500-lb capacity load cells were tested at the manufacturer's laboratory using dead weights as the reference standard. The data were analyzed for multiple load cell applications. The cells were tested over a temperature range of -10 °C to 40 °C. Three tests were run on each cell at each temperature. The temperature effect on zero was measured and a time dependence (creep) test was performed. The barometric pressure test was waived due to the insensitivity of the load cell design to changes in barometric pressure.

The results of the evaluations indicate the load cell complies with applicable requirements of NIST Handbook 44.

Type Evaluation Criteria Used: NIST Handbook 44, 2004 Edition

Tested By: NIST Force Group, NIST Office of Weights and Measures

Information Reviewed By: NTEP Director

Scale and Component Suitability



Temperature Changes are a Significant Issue

- T.N.8.1.3. Temperature Effect on Zero Load Balance – zero shall not vary by more than 3 d per 5 °C (9 °F) change in temperature for Class IIIIL scales.
- NTEP testing includes temperature chamber tests under load conditions.

S.5.4. “Load Cell Suitability”

- If a scale is assembled of components or modified their suitability must be assured.
- Electronic Scale $V_{\min} \leq d/\sqrt{N}$
- Electro-mechanical Scale $V_{\min} \leq d/\sqrt{N} \times \text{Scale Multiple}$
- Does not apply to most devices (e.g., CC and AZM – See S.5.4.)

Indicating and Recording Elements

■ S.5.1. Accuracy Class

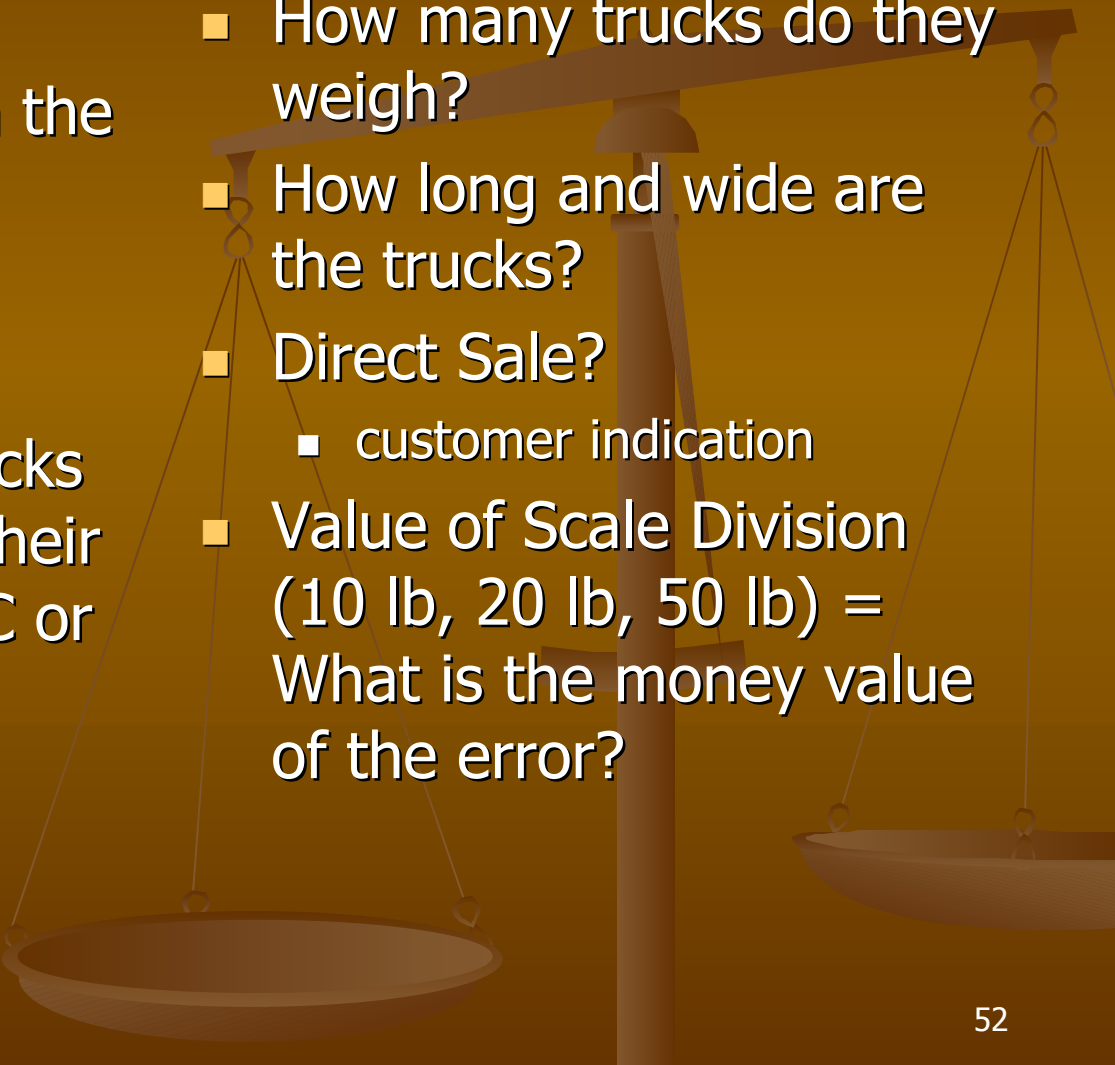
- See Table 3 Parameters for Accuracy Class
- IIIL (See Table 7a for Weighing Applications)
- d equal to or greater than 5 lb
- At least 2,000 d but not more than 10,000 d
- S.1.2 Value of Scale Division: 1, 2, or 5
 - 10, 20, 50, or 100, 200, or 500
 - $120,000 \times 20 \text{ lb} = 6,000 \text{ d}$
 - $120,000 \times 50 \text{ lb} = 2,400 \text{ d}$

Scale Suitability



- **UR.1. Selection Requirements.** - Equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to, its capacity, number of scale divisions, value of the scale division or verification scale division, minimum capacity, and computing capability.
- Footnote: Purchasers and users of ...vehicle scales should be aware of possible additional requirements for their design and installation.

Scale Suitability Criteria

- 
- Capacity
 - What do they do with the scale?
 - Buying/Selling
 - Axle Loads
 - How much do the trucks weigh and what are their axle loads? Is the CLC or Section Capacity appropriate for the trucks?
 - How many trucks do they weigh?
 - How long and wide are the trucks?
 - Direct Sale?
 - customer indication
 - Value of Scale Division (10 lb, 20 lb, 50 lb) = What is the money value of the error?

Scale Suitability Criteria

- Unmarked (Pre 86)

Table 7b –

- Up to 200,000 lbs up to 20 lb
- More than 200,000 lb up to 50 lb

- Marked

- Table 7a = Class IIIL

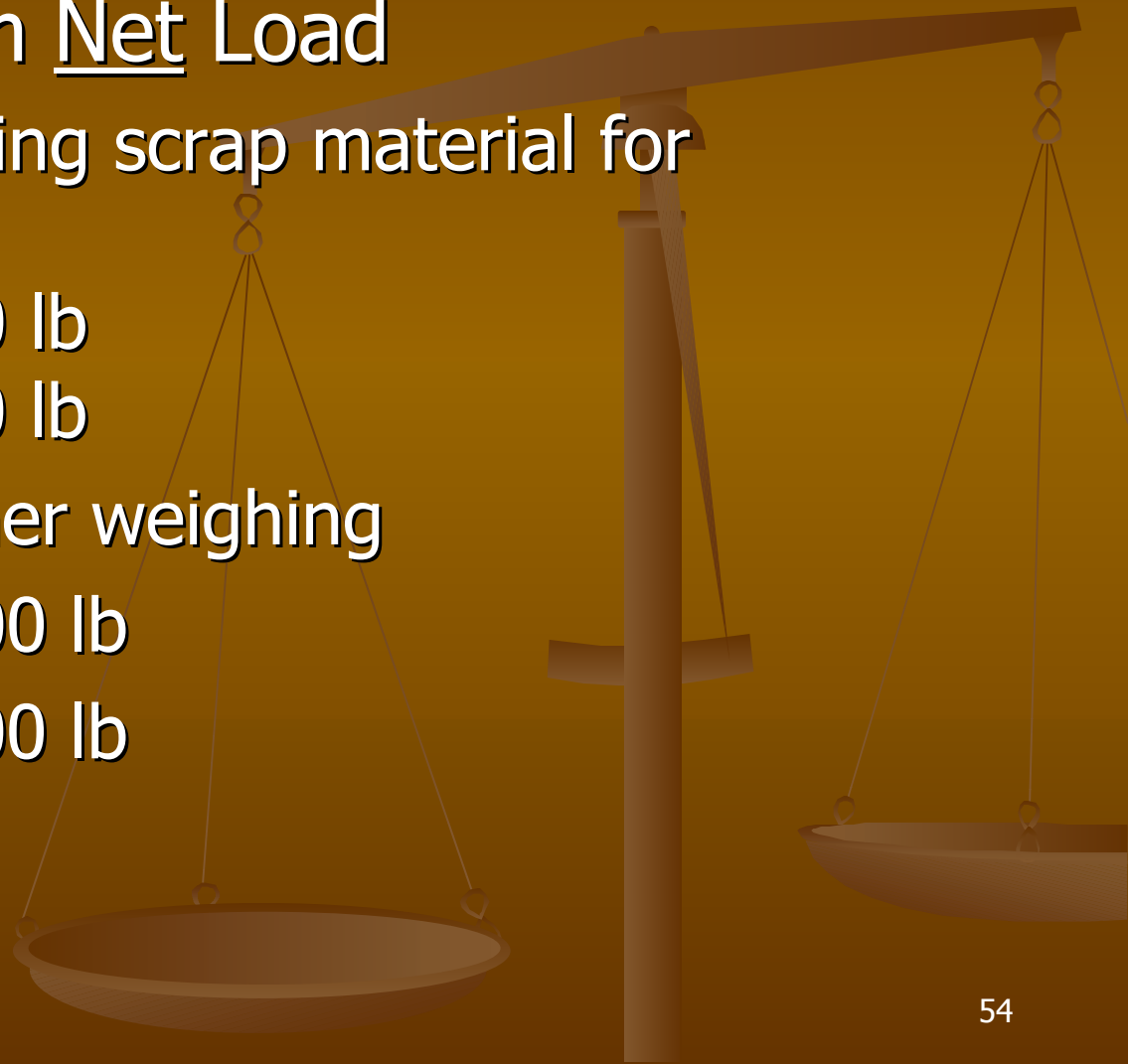
- UR.3.1.

Recommended Minimum Load

- Table 8 = 50 d
- $50 \times 20 = 1000 \text{ lb}$
- $50 \times 50 = 2500 \text{ lb}$
(See UR.3.7)

Scale Suitability Criteria

- UR.3.7 Minimum Net Load
 - a. 10 d for weighing scrap material for recycling.
 - $10 \times 20 = 200 \text{ lb}$
 - $10 \times 50 = 500 \text{ lb}$
 - b. 50 d for all other weighing
 - $50 \times 20 = 1000 \text{ lb}$
 - $50 \times 50 = 2500 \text{ lb}$



Other Requirements for Digital Indicators

- S.5.3. Multi-Interval and Multiple Range Scales, Division Value
 - e shall be equal to d
- G-S.5.2.2. Digital Indication and Representation.
 - digital values agree and coincides with any associated analog value to the nearest graduation.
 - rounds off to the nearest minimum unit that can be indicated or recorded.

Other Requirements for Digital Indicators


- *S.1.12. Manual Gross Weight Entries:*
 - *Accepted only when the scale is in the gross weight mode and the indication is on zero.*
 - *Recorded entries must indicate that they are "Manual Weight Entries" and any symbols or abbreviations are clearly shown on documentation.*
- UR.3.9 Use of Manual Gross Weight Entries: only permitted on vehicle scales to correct erroneous tickets.

Other Requirements for Digital Indicators

■ S.2.3. Tare

- Value of tare division must equal d.
- Shall operate only in the minus direction with respect to zero-load balance.
- *Automatic clearing is permitted once the transaction has been completed and indicated.*
- *Computing scales must require the input of a unit price, the display of a unit price, and the display of a total price. Other devices require a complete gross, tare, and net weight determination (1983).*

Appropriateness of Design

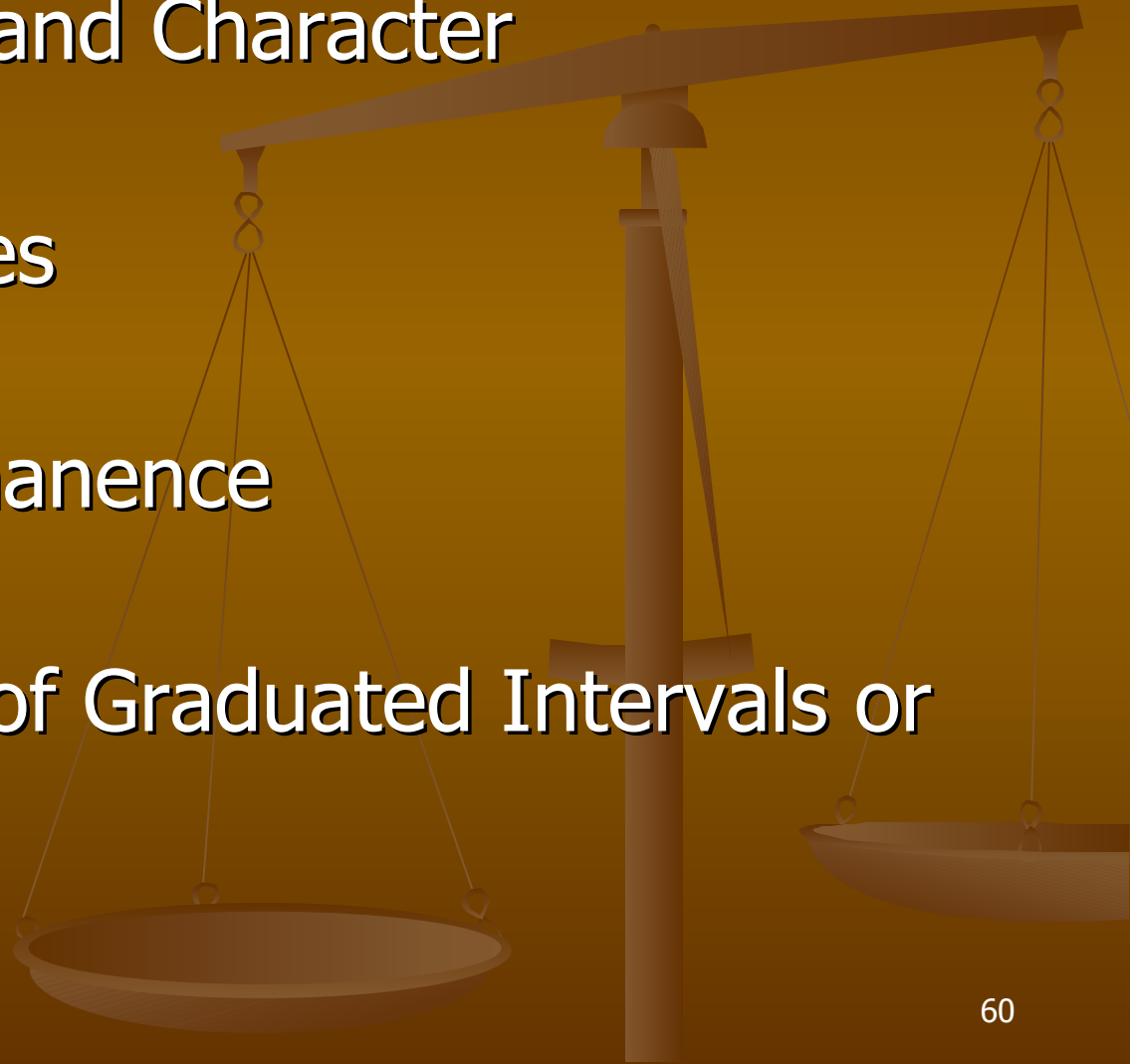


Indicators

- G-S.5.1 General:
 - A devices must have an indicator or recorder appropriate in design and amount.
 - Clear, definite, accurate, and easily read under any conditions of normal use.
- G-S.5.2.1. Analog Indication and Representation.
 - Indicator and graduation operate continuously.

Analog Indications

- G-S.5.2.3. Size and Character
- G-S.5.2.4. Values
- G-S.5.2.5. Permanence
- G-S.5.3 Values of Graduated Intervals or Increments.

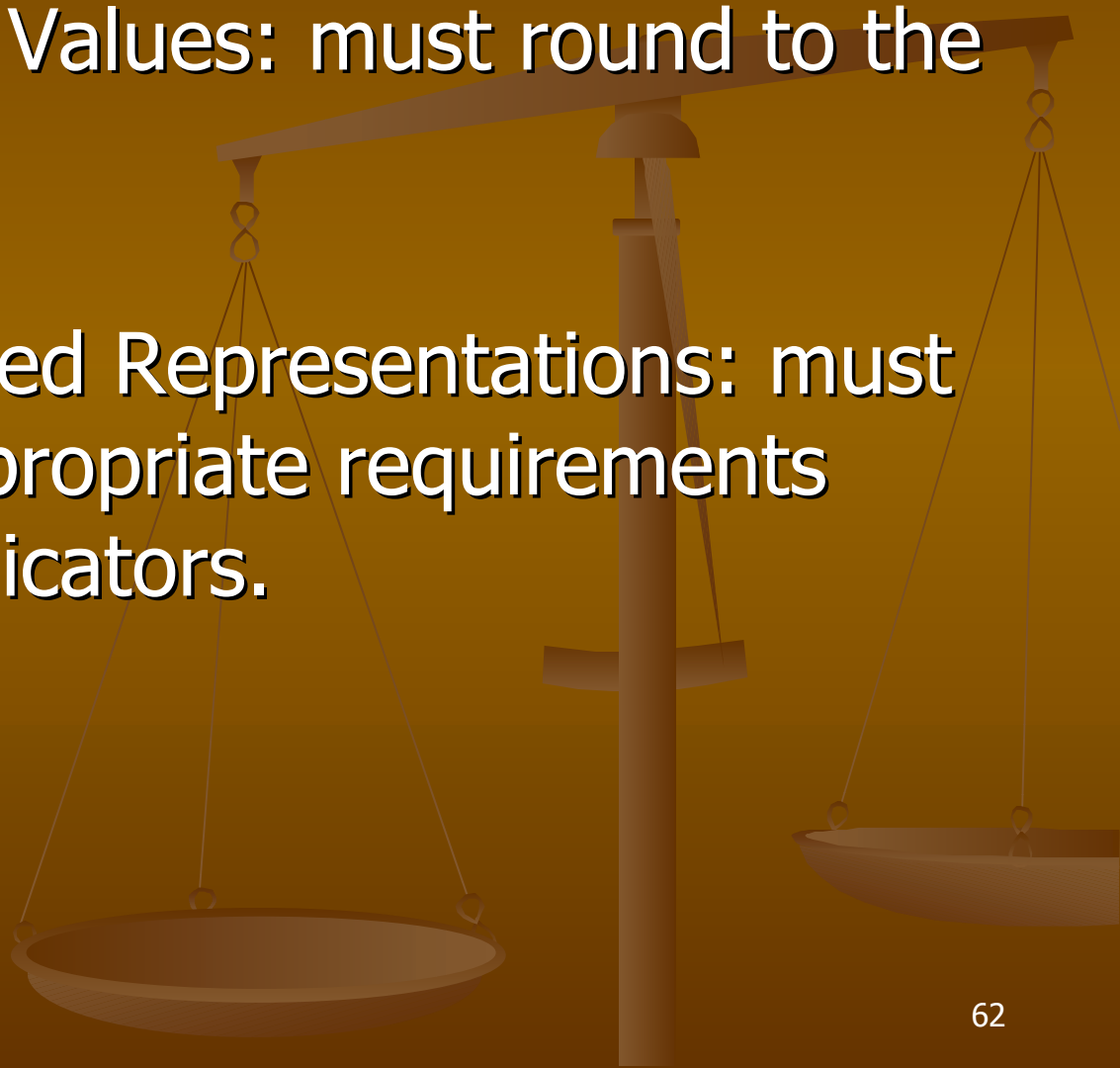


Indications

- G-S.5.3.1 Devices that indicate or record in more than one unit shall identify values appropriately.
- G-S.5.4. Repeatability Indications: must repeat within tolerances under repeated operation and normal use.

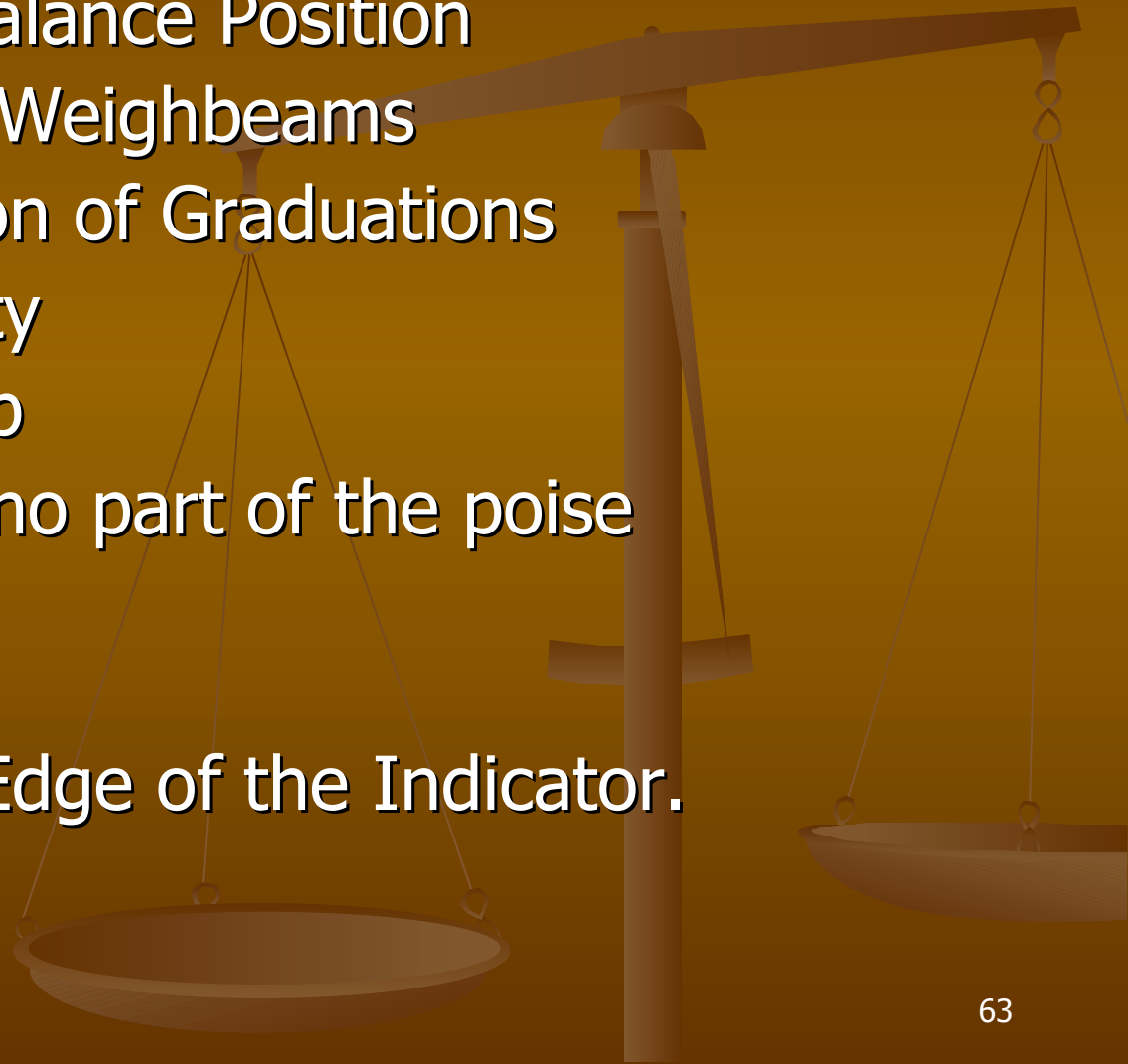
Indications

- G-S.5.5. Money Values: must round to the nearest 1 cent.
- G-S.5.6. Recorded Representations: must comply with appropriate requirements specified for indicators.



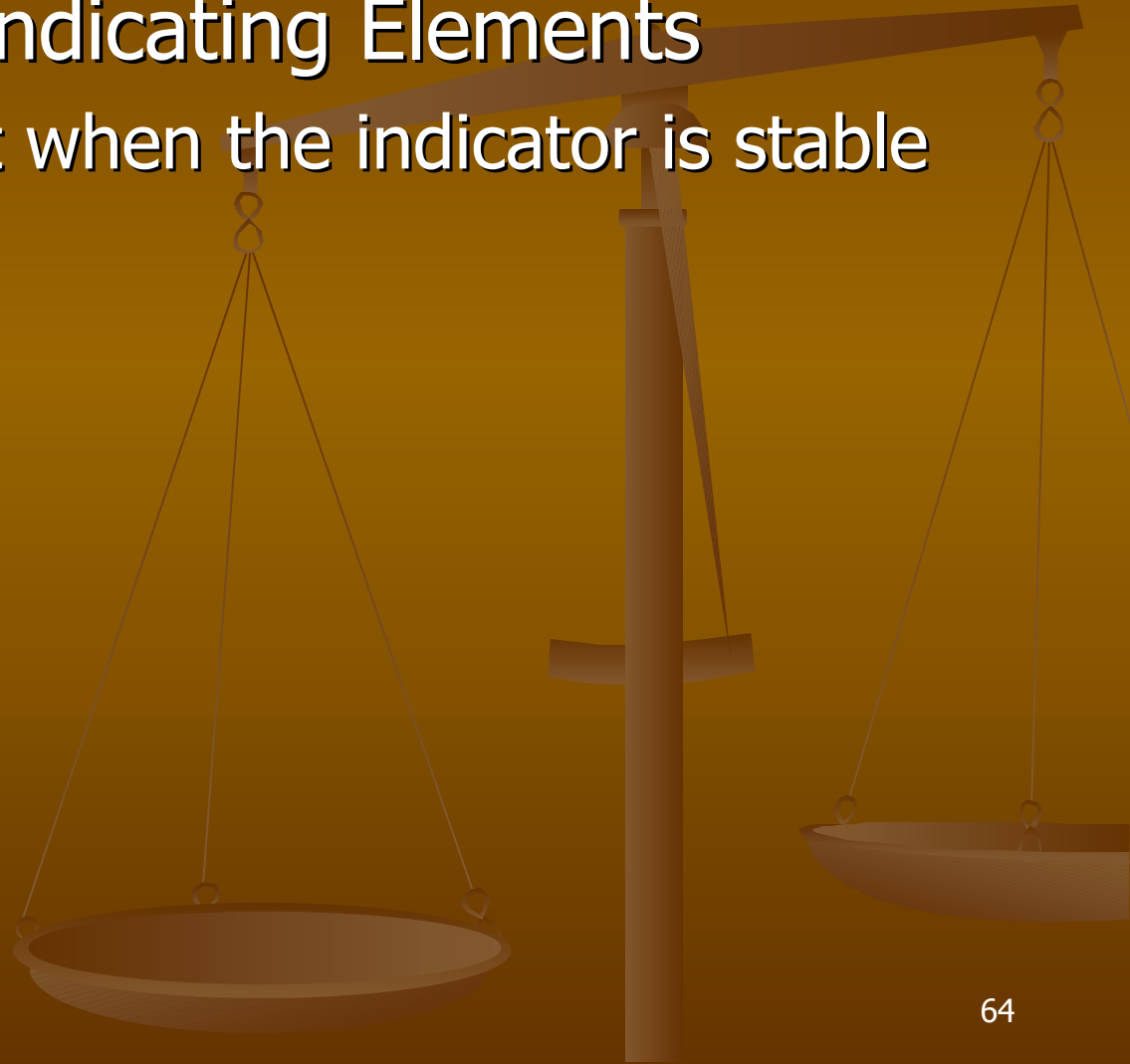
Weighbeams

- S.1.5.1. Normal Balance Position
- S.1.5.2. Travel of Weighbeams
- S.1.5.3. Subdivision of Graduations
- S.1.5.4. Readability
- S.1.5.6. Poise Stop
- S.1.6.1. General (no part of the poise detachable)
- S.1.6.3. Pawl
- S.1.6.4. Reading Edge of the Indicator.



Motion Detection

- S.2.5.1 Digital Indicating Elements
 - Shall only print when the indicator is stable within ± 3 d.



Installation & Suitability



G-UR.2.1. Installation.

- A device shall be installed in accordance with the manufacturer's instructions, including any instructions marked on the device. A device installed in a fixed location shall be installed so that neither its operation nor its performance will be adversely affected by any characteristic of the foundation, supports, or any other detail of the installation.

G-UR.2.2. Installation of Indicating and Recording Element

- A device shall be so installed that there is no obstruction between a primary indicating or recording element and the weighing or measuring element; otherwise there shall be convenient and permanently installed means for direct communication, oral or visual, between an individual located at a primary indicating or recording element and an individual located at the weighing or measuring element. [See also G-UR.3.3.]

Installation

- **G-UR.2.3. Accessibility for Inspection, Testing, and Sealing Purposes.** - A device shall be located, or such facilities for normal access thereto shall be provided, to permit:
 - a. inspecting and testing the device;
 - b. inspecting and applying security seals to the device; and
 - c. access for test equipment.
- Otherwise, the owner or operator must provide labor and materials as required.

Environmental Factors

- **UR.2.3. Protection From Environmental Factors.** - The indicating elements, the lever system or load cells, and the load-receiving element of a permanently installed scale, and the indicating elements of a scale not intended to be permanently installed, shall be adequately protected from environmental factors such as wind, weather, and RFI that may adversely affect the operation or performance of the device.



UR.2.4. Foundation, Supports, and Clearance.

- The foundation and supports of any scale installed in a fixed location shall be such as to provide strength, rigidity, and permanence of all components, and clearance shall be provided around all live parts to the extent that no contacts may result when the load-receiving element is empty, nor throughout the weighing range of the scale. *On vehicle and livestock scales, the clearance between the load-receiving elements and the coping at the bottom edge of the platform shall be greater than at the top edge of the platform. [1973]*

UR.2.5. Access to Weighing Elements.

- Adequate provision shall be made for ready access to the pit of a vehicle, livestock, animal, axle-load, or railway track scale for the purpose of inspection and maintenance. Any of these scales without a pit shall be installed with adequate means for inspection and maintenance of the weighing elements.

Approaches – Vehicle Scales

UR.2.6.1. Vehicle Scales. - *On the entrance and exit ends of a vehicle scale installed in any one location for a period of 6 months or more, there shall be a straight approach as follows:*

(a) the width at least the width of the platform,

(b) the length at least one-half the length of the platform but not required to be more than 12 m (40 ft), and

- *(c) not less than 3 m (10 ft) of any approach adjacent to the platform shall be constructed of concrete or similar durable material to ensure that this portion remains smooth and level and in the same plane as the platform. However, grating of sufficient strength to withstand all loads equal to the concentrated load capacity of the scale may be installed in this portion. Any slope in the remaining portion of the approach shall ensure (1) ease of vehicle access, (2) ease for testing purposes, and (3) drainage away from the scale. (1976)*

UR.2.6.2. Axle-Load Scales. - At each end of an axle-load scale there shall be a straight paved approach in the same plane as the platform. The approaches shall be the same width as the platform and of sufficient length to insure the level positioning of vehicles during weight determinations.









Maintenance

- G-UR.4.1. – Maintenance of Equipment – “proper operating condition” throughout its service life.
- G-UR.4.2. – Abnormal Performance – “brought to the attention of competent service personnel”
- G-UR.4.2. – Use of Adjustments – “as close as practical to zero value.”

Modifications

- **UR.4.3. Scale Modification.** - The dimensions (e.g., length, width, thickness, etc.) of the load receiving element of a scale shall not be changed beyond the manufacturer's specifications, nor shall the capacity of a scale be increased beyond its design capacity by replacing or modifying the original primary indicating or recording element with one of a higher capacity, except when the modification has been approved by a competent engineering authority, preferably that of ... the manufacturer of the scale, and by the official.

Use

- G-UR.3.1. Method of Operation.
- G-UR.3.2. Associated and Nonassociated Equipment.
- G-UR.3.3. Position of Equipment.
- G-UR.3.4. Responsibility, Money-Operated Devices.
- UR.2.8. Hoists.

Use - Loading

- UR.3.2. Maximum Load. - A scale shall not be used to weigh a load of more than the nominal capacity of the scale.
- UR.3.2.1. Maximum Loading for Vehicle Scales.
 - A vehicle scale shall not be used to weigh loads exceeding the maximum load capacity of its span as specified in Table UR.3.2.1.

UR.3.3. Single-Draft Vehicle Weighing.

- A vehicle or a coupled vehicle combination shall be commercially weighed on a vehicle scale only as a single draft. That is, the total weight of such a vehicle or combination shall not be determined by adding together the results obtained by separately and not simultaneously weighing each end of such vehicle or individual elements of such coupled combination.

UR.3.3. Single-Draft Vehicle Weighing.

However:

- the elements may be uncoupled (tractor, semitrailer, trailer), and be weighed individually.
- the weights obtained while all individual elements are resting simultaneously on more than one scale platform may be added together.

Note: this paragraph does not apply to highway law-enforcement scales and scales used for the collection of statistical data.

Assistance

- **G-UR.4.4. Assistance in Testing Operations.** - if the design, construction, or location of any device is such as to require a testing procedure involving special equipment or accessories or an abnormal amount of labor, such equipment, accessories, and labor shall be supplied by the owner or operator of the device as required by the weights and measures official.